IA-05

Nanomotion based antibiotic sensitivity test

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Several years ago we noticed that attaching living organisms onto an atomic force microscope (AFM) cantilever can be a very efficient way to detect life-death transitions in a label free manner [1]. The technique is based on the observation that all living organisms oscillate at a nanometric scale as long they are alive and stop these movements as soon the organism dies. Traditional AFM cantilevers and their associated deflection sensors can easily detect these tiny oscillations. Therefore, such an experiment can be carried on in any biologically oriented commercially available AFM. A typical experiment consists in attaching the organism of interest onto a cantilever and inserting it into the AFM. The oscillations of the lever are monitored for about 15 minutes and eventually a drug that modifies the organism's metabolism is injected into the analysis chamber. The modifications occurring in the oscillation pattern before and after the injection are used to assess the action of the drug. The technique was successfully tested on bacteria, yeast, vegetal and animal cells. The technique offers novel avenues to explore living organisms in a label free and chemistry independent manner.

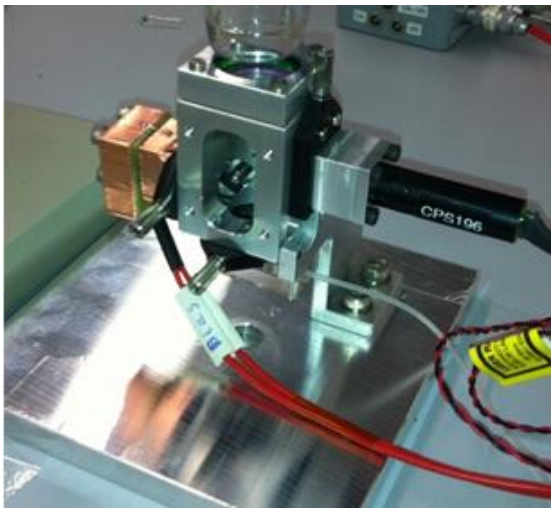

Figure 1. Home-made nanomotion detector.

In our laboratory we are using this technique as an ultra-rapid antibiotic sensitivity test (AST). The method permits to assess the sensibility of a given bacteria to antibiotics in a timeframe of minutes instead of days or weeks as it is the case nowadays with the traditional ASTs. In order to reduce the costs and simplify the use of the instrument we develop our own dedicated nanomotion detectors. Several such prototypes are already implemented in research centers and university hospitals for validation proposes.

During the presentation, the working principle of the technique will be explained and numerous potential applications will be discussed.

1. Kasas S. et al., *PNAS*, 112, 378 (2015).